

## Claims

[c1] A process for deethanizing a light hydrocarbon stream comprising olefins, comprising:

- feeding one or more light hydrocarbon streams comprising ethylene, ethane, propylene and propane to a primary deethanizer having absorption and stripping sections at a primary deethanizer pressure;
- refluxing the absorption section of the primary deethanizer to produce a rectified stream or streams containing less than 1 mole percent propylene and propane, wherein the rectified stream or streams together comprise from 80 to 99 percent of the feed ethane;
- reboiling the stripping section of the primary deethanizer to produce a primary deethanizer bottoms stream comprising from 1 to 20 percent of the feed ethane;
- feeding the primary deethanizer bottoms stream to a secondary deethanizer having absorption and stripping sections at a pressure less than the primary deethanizer pressure;
- refluxing the absorption section of the secondary deethanizer to produce an overhead vapor stream of

ethane essentially free of ethylene; and  
reboiling the stripping section of the secondary  
deethanizer to produce a deethanized stream essen-  
tially free of ethane.

- [c2] The process of claim 1 wherein the primary deethanizer reboiling is at a temperature less than 80°C (175°F).
- [c3] The process of claim 1 wherein heat for the secondary deethanizer reboiling is supplied by hot water.
- [c4] The process of claim 1 wherein heat for the secondary deethanizer reboiling is supplied by condensing propylene refrigerant.
- [c5] The process of claim 1 wherein the heat for the primary deethanizer reboiling is provided by steam.
- [c6] The process of claim 1 wherein the primary deethanizer bottoms stream comprises from 10 to 12 percent of the feed ethane and the overhead vapor stream from the secondary deethanizer comprises less than 1 mole per-  
cent ethylene.
- [c7] The process of claim 6 further comprising supplying the overhead vapor stream from the secondary deethanizer to cracking furnace feedstock.
- [c8] The process of claim 6 further comprising supplying the

overhead vapor stream from the secondary deethanizer to burner fuel.

- [c9] The process of claim 6 wherein the deethanized stream comprises less than 0.5 mole percent ethane.
- [c10] In a process for recovering olefins from a cracking furnace effluent, comprising compression of the effluent with a process gas compressor followed by fractionation in a demethanizer, deethanizer, depropanizer, debutanizer, C2 splitter and C3 splitter to obtain purified streams of at least ethane, ethylene, propane, and propylene, the improvement wherein the fractionation in a deethanizer comprises:
  - feeding one or more light hydrocarbon streams comprising ethylene, ethane, propylene and propane to a primary deethanizer having absorption and stripping sections at a primary deethanizer pressure;
  - refluxing the absorption section of the primary deethanizer to produce a rectified stream or streams containing less than 1 mole percent propylene and propane, wherein the rectified stream or streams together comprise from 80 to 99 percent of the feed ethane;
  - reboiling the stripping section of the primary deethanizer to produce a primary deethanizer bottoms stream comprising from 1 to 20 percent of the feed

ethane;  
feeding the primary deethanizer bottoms stream to a secondary deethanizer having absorption and stripping sections at a pressure less than the primary deethanizer pressure;  
refluxing the absorption section of the secondary deethanizer to produce an overhead vapor stream of ethane essentially free of ethylene; and  
reboiling the stripping section of the secondary deethanizer to produce a deethanized stream essentially free of ethane.

- [c11] The improvement of claim 10 further comprising removing the overhead ethane stream from the process.
- [c12] The improvement of claim 11 further comprising feeding the overhead ethane stream to the cracking furnace.
- [c13] The improvement of claim 10 wherein the secondary deethanizer is refluxed with liquid ethane recovered from the C2 splitter.
- [c14] The improvement of claim 10 wherein the process employs a front-end demethanizer, from 10 to 12 percent of the feed ethane is recovered in the primary deethanizer bottoms stream, and the primary deethanizer reboiling is at a temperature less than 80°C (175°F).

- [c15] The improvement of claim 10 wherein the process employs a front-end demethanizer and heat for the secondary deethanizer reboiling is supplied by hot water.
- [c16] The improvement of claim 10 wherein the process employs a front-end depropanizer and heat for the secondary deethanizer reboiling is supplied by condensing propylene refrigerant.
- [c17] An apparatus for deethanizing a light hydrocarbon stream comprising olefins, comprising:
  - means for feeding one or more light hydrocarbon streams comprising ethylene, ethane, propylene and propane to a primary deethanizer having absorption and stripping sections at a primary deethanizer pressure;
  - means for refluxing the absorption section of the primary deethanizer to produce a rectified stream or streams containing less than 1 mole percent propylene and propane, wherein the rectified stream or streams together comprise from 80 to 99 percent of the feed ethane;
  - means for reboiling the stripping section of the primary deethanizer to produce a primary deethanizer bottoms stream comprising from 1 to 20 per-

cent of the feed ethane;  
means for feeding the primary deethanizer bottoms stream to a secondary deethanizer having absorption and stripping sections at a pressure less than the primary deethanizer pressure;  
means for refluxing the absorption section of the secondary deethanizer to produce an overhead vapor stream of ethane essentially free of ethylene;  
and  
means for reboiling the stripping section of the secondary deethanizer to produce a deethanized stream essentially free of ethane.

[c18] A method for retrofitting an original olefin separation unit, wherein the original olefin separation unit comprises a process gas compressor, a demethanizer, an original deethanizer, a depropanizer, a C2 splitter and a C3 splitter, and the original deethanizer comprises absorption and stripping sections, for the separation of ethylene and ethane from an olefin feed gas stream, comprising the steps of:

- installing a secondary deethanizer having absorption and stripping sections downstream from the original deethanizer;
- supplying one or more light hydrocarbon streams

comprising ethylene, ethane, propylene and propane to the original deethanizer operating as a primary deethanizer, having absorption and stripping sections at a primary deethanizer pressure; refluxing the absorption section of the primary deethanizer to produce a rectified stream or streams containing less than 1 mole percent propylene and propane, wherein the rectified stream or streams together comprise from 80 to 99 percent of the feed ethane; reboiling the stripping section of the primary deethanizer to produce a primary deethanizer bottoms stream comprising from 1 to 20 percent of the feed ethane; supplying the primary deethanizer bottoms stream to the secondary deethanizer; refluxing the absorption section of the secondary deethanizer to produce an overhead vapor stream of ethane essentially free of ethylene; and reboiling the stripping section of the secondary deethanizer to produce a deethanized stream essentially free of ethane. The method of claim 18 wherein the primary deethanizer boiling is at a temperature less than 80°C (175°F).

[c19] The method of claim 18 wherein the primary deethanizer

bottoms stream comprises from 10 to 12 percent of the feed ethane and the overhead vapor stream from the secondary deethanizer comprises less than 1 mole percent ethylene.

- [c20] The method of claim 18 further comprising supplying the overhead vapor stream from the secondary deethanizer to cracking furnace feedstock.
- [c21] The method of claim 18 wherein the deethanized stream comprises less than 0.5 mole percent ethane.